

# **A Study on an Analysis of Water, Sanitation and Hygiene Practice: A case of Lahan Municipality, Madhesh Province, Nepal**

## **ABSTRACT**

The study aims to assess the water, sanitation and hygiene practices in Lahan Municipality, Siraha district. The focus group discussion, participatory learning and action, key informant interview, direct observation etc., methods was used during the study. Alluvial aquifers are the source of water supply in the Terai region.

Result shows that around 16 % of households have access to piped drinking water that is extracted from the deep boreholes. The rest of the population has access to shallow boreholes and dug wells. The poor families have installed shallow boreholes less than 15 meters deep. Out of 10 wards in Lahan municipality, ward no. 4 is lagging far behind in terms of water, sanitation, hygiene and socio-economic status. Lahan Municipality has been affected mostly due to flood in monsoon season. Lack of safe toilet ranked first among the list of major problems. Similarly, less awareness on water, sanitation and hygiene and poor embankment ranked second and third respectively identified as major problems in Lahan Municipality. Around 77 % of fecal sludge is unsafely managed in the areas. The gender inequality, poverty, caste-based discrimination also found the social problem in the society.

Keywords: Water & sanitation, Hygiene, social status, inclusion, shallow boreholes,

## **1. INTRODUCTION**

### **1.1 Background**

Groundwater is abundant in lowland Terai region where it is an important resource for domestic and agricultural use. The region is estimated to have around 800,000 tube wells, which supply groundwater for some 11 million people (World Bank, 2004). As of September 2003, 25,000 water analyses of arsenic had been carried out and results indicate that 69% of groundwater sampled had arsenic concentrations less than 10 µg /L, while 31% exceeded 10 µg/ L, and 8% exceeded 50 µg/ L (Tuinhof and Nanni 2003; Shrestha *et al.*, 2004, Pathak, 2006).

Lahan Municipality is a small commercial town in Siraha District, located in province number 2 in Nepal. It is built along the East-West Highway and has a population of about 93,000 people. It is nearly 350 kilometers east of the capital city Kathmandu. Lahan is located at latitude of

26.717°N and longitude of 86.483°E. It is built primarily on flood plain in the Terai region of southern Nepal and Northern India, which lies south of the outer foothills of the Himalayas known as the Siwalik Hills and north of the Indo-Gangetic Plain. The municipality covers an area of 167.17 km<sup>2</sup> (64 percent lowland and 36 percent Siwalik Hills) and lies at an elevation of 104-327 meters above sea level. About 61.5 percent of the land is agricultural, making the peri-urban area larger than the core city area (Lahan Municipality, 2016).

NWSC (2017) has pointed out that alluvial aquifers are the only source of water supply in the Terai region. About 16 percent of households have access to piped drinking water, which is extracted from deep boreholes. The rest of the population has access to shallow boreholes and dug wells. It is indicated that lower middle income and poor families have installed shallow boreholes less than 15 meters deep. The nearby Khutti River regularly floods during the monsoon (June to September) and some households experience frequent inundation during this period. As a result, some household toilets are flooded, forcing people to defecate in the open on higher ground. The municipality was declared open defecation free (ODF) in 2017 (NWSC, 2017, WAN, 2018).

## 1.2 Objectives

- (i) To assess the risks and problems associated with water, sanitation and hygiene in Lahan municipality
- (ii) To conduct stakeholder analysis in water, sanitation and hygiene sector in Lahan municipality
- (iii) To understand about social and economic status of people in Lahan Municipality

## 2. METHODOLOGY

Participatory approach was used for the study, in which, the community people, especially the poor, and marginalized, themselves identified the problems in their community. Similarly, both women and men in the community including children, elderly people and people with physical disability were given equal opportunities to express their opinion regarding water, sanitation, hygiene, socio-economic condition in the community (Thapa, 2005).

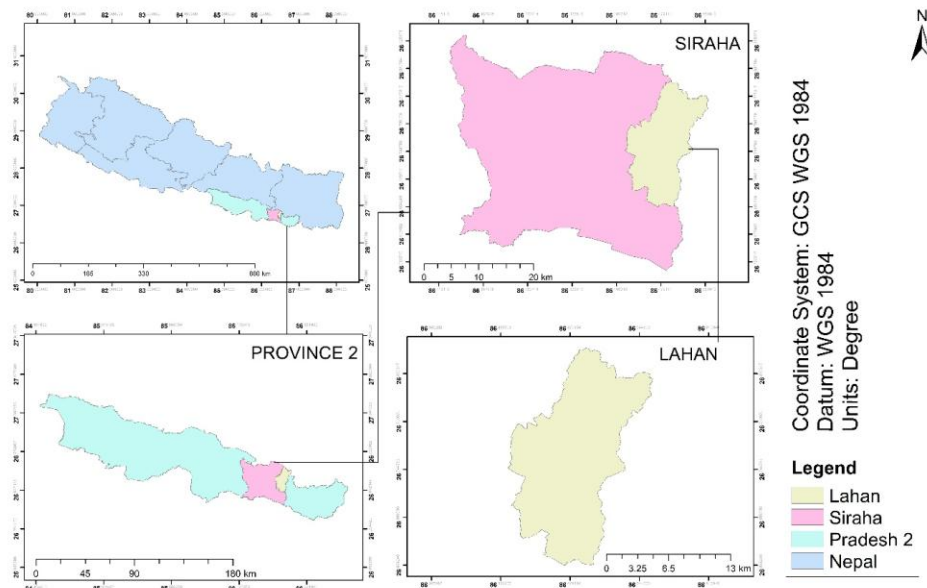
The basket of participatory methods was adopted during the study that includes focus group discussion, participants' observation, key informant interview, ranking and scoring, case lets etc. Ranking and scoring have been used in different communities to assess people's expectations. Thapa (2018) has stated that the technique has been used for obtaining sensitive information such as income or wealth of the people living in a community as well (Thapa, 2018).

This study was conducted in 2018 and 2019 and the collected data were analyzed compiled using SPSS Vol 24 that was later applied by the support of excel and prepared table and maps accordingly.

### Study area Map

**Comment [SS1]:** It would be good if the author(s) attach a sample of any questionnaire or any other data gathering tools that they used for their study to the manuscript.

**Comment [SS2]:** This sentence is a little bit confusing. Please explain Thapa and the technique.



(Map1: showing the study area of Lahan-Siraha district within Nepal)

### 3. RESULTS AND DISCUSSION

#### 3.1 Gender Equality and Social Inclusion-GESI

Gender Equality and Social Inclusion (GESI) is a concept that addresses unequal power relations experienced by people on the grounds of gender, wealth, ability, location, caste/ethnicity, language and agency or a combination of these dimensions. It focuses on the need for action to re-balance these power relations, reduce disparities and ensure equal rights, opportunities and respect for all individuals *regardless of their social identity*(MOHP/GoN, 2013).

“Excluded Groups” refer to women, Dalits, indigenous ethnic groups, Madhesi, Muslim, persons with disabilities, elderly people and people living in remote areas. These groups have been systematically excluded over a long time due to economic, caste, ethnic, gender, disability, and geographic reasons and include sexual and gender minorities.

##### 3.1.1 Gender Division of Work

The division of labour refers to who does what work in different spheres. Traditionally it has always been women who work in the domestic sphere. It arose in the 1960s as an attempt by radical feminists to give an account of the oppression of women in the societies. Nepali society is

**Comment [SS3]:** It will be more suitable if the author(s) include a paragraph here to briefly list all of the important parameters and explain these parameters resources if they are defined by the author(s) themselves.

traditional farming community in general where woman more engaged in the domestic chore whereas man deals with the external affairs.

Men are more involved in agricultural activities like tillage, irrigating land and selling of rice and it by products, etc. Women are more involved in social functions like attending marriage, religious ceremonies and taking care of the children and family members. In addition, women are involved in sanitation activities like cleaning house premises, fetching water, etc. The gender division of work has been presented below (Table 1).

**Table 1: Gender Division of Labour**

Activities	Division of work	
	Women	Men
<b>Agricultural activities</b>		
Plough land	0	10
Seed storage	5	10
Buying of seed and fertilizers	5	10
Composting	5	10
Manuring in land	5	10
Spraying of insecticide	0	10
Weeding	10	10
Grain harvesting	10	5
Grain winnowing( rice, wheat, maize, pulses, mustard etc)	10	5
Grain storage	10	10
Grain selling	5	10
Crop husbandry	5	10
Buying of tillage implements (plough and spade)	0	10
Sowing and transplanting of crops	10	5
Irrigating land	5	10
Transportation of rice and it's by products	0	10
<b>Social functions</b>		
Attending delivery case	10	5
Attending funeral ceremony	10	10
Attending marriage ceremony	10	10
Attending religious ceremony	10	5
Participation in village group meeting	5	10
Caring children	10	5
Washing, bathing, and putting clothes on children	10	5
Medical care to children	10	10
Medical care of other household members	5	10
Serving food to children	10	0
Sending children to school daily	10	5
Main responsibility in educating children	5	10
<b>Sanitation of housing premises</b>		
Sanitation of house yard	10	5
Repairing of house	5	10
House washing	10	5
Fetching water	10	5

Marketing of consumable goods	5	10
-------------------------------	---	----

Source: Focus Group Discussion, 2013

Note: 10= High involvement, 5= Partial involvement, 0= No involvement

### 3.1.2 Access and Control over Resources by Man and Woman

Access to material and financial resources and services ... women who do not come from prosperous families often have at their disposal only a small amount of starting capital. ... Who has control over the resources needed to do the work (www.fastonline.org).

**Comment [SS4]:** This paragraph seems uncomplete.

Both men and women have equal access over equipment and property but men hold more control over property and equipment in Lahan municipality. Similarly, men hold more control over income generation work while women hold more control over domestic work. In addition, men hold more control over decision making. For example, a wife cannot work outside the home without an approval from her husband. If the husband does not allow her to work outside, she has to stay in the home. She cannot go against the decision of her husband and work outside. The access and control over resources by gender has been presented below (Table 2).

**Table 2: Access and control over resources by gender**

Activities	Access		Control	
	Women	Men	Women	Men
<b>Equipment / property</b>				
Land	10	10	5	10
Equipment	10	10	5	10
House	10	10	5	10
Ornaments	10	10	10	5
Livestock	10	10	10	5
Cash	10	10	5	10
<b>Labor</b>				
Production( income generation work )	5	10	5	10
Reproduction ( domestic work)	10	5	10	5
<b>Income</b>				
External income	10	10	5	10
Right to equipment	10	10	5	10
<b>Main Needs</b>				
Food	10	10	5	10
Cloth	10	10	5	10
House	10	10	5	10
Political power	10	10	5	10
<b>Participation in decision making</b>				
Buying and selling of land	10	10	5	10
Buying and selling of livestock	10	10	5	10
Buying and selling of fowl	10	10	10	5
Grain selling	10	10	10	5
Borrow money without interest rate	10	10	5	10
Credit (give and take)	5	10	5	10
Marketing	5	10	5	10
Invitation to guests	10	10	10	10
Growing crops	10	10	10	10
Marriage of son and daughter	10	10	5	10
Schooling of son and daughter	10	10	5	10

Celebration of festivals	10	10	10	10
Pilgrims	10	10	10	10
Medical care	10	10	5	10
Candidate in political election	5	10	5	10
Right to vote	10	10	5	10
Choosing political party	10	10	5	10
Involved in social organization	10	10	5	10
Agricultural labor	10	10	10	10
Outside employment	10	10	5	10
Hiring servants	10	10	5	10
Deployment of labor	10	10	5	10

Source: Focus Group Discussion, 2013

### 3.1.3 Activity Profile

The *allocation of women's and men's time* between paid and unpaid work in the context of life-cycle is called activity profile. This daily activity profile is useful for finding out work load for both men and women, which can be used to determine most appropriate time of day for any kind of training or meeting. There is more work load to women compared to men. Women workload has been reported as 13.5 hours a day while men workload accounts 9.5 hours a day excluding time of having meal, gossiping and sleeping. Women allocate much of their time in domestic work while men allocate much of their time in income generation work. The daily time allocation by women and men has been presented below (Table 3).

**Table 3: Daily time allocation by women and men**

Time	Women	Time	Men
5:00 AM	Getting up	6:00 AM	Getting up
5:00-6:00 AM	Cleaning the house/fetching water	6:00-7:00 AM	Having tea/breakfast/Gossiping
6:00-6:30 AM	Preparing breakfast	7:00-7:30 AM	Getting prepared for work
6:30-7:30 AM	Feeding cattle	7:30 AM-12:00 PM	Working as daily wage earner
7:30-8:30 AM	Preparing meal	12:00-1:00 PM	Having meal
8:30-9:00 AM	Feeding children and other family members	1:00-6:00 PM	Working as daily wage earner
9:00-9:30 AM	Preparing children for school	6:00-7:00 PM	Visiting market and eat snacks
9:30-10:00 AM	Having breakfast	7:00-9:00 PM	Returning to home and watching TV
10:00-11:00 AM	Cleaning utensils	9:00-10:00	Having dinner
11:00 AM-12:00 PM	Washing clothes	10:00-11:00	Going to bed
12:00-1:00 PM	Serving food to head of the family		
1:00-1:30 PM	Having meal		
1:30-2:00 PM	Cleaning utensils		
2:00-3:30 PM	Sleeping/Gossiping		
3:30-4:00 PM	Preparing snacks		
4:00-6:00 PM	Visiting market for purchase of daily consumable items		

6:00-7:00 PM	Managing cattle		
7:00-8:30 PM	Preparing dinner		
8:30 -9:30 PM	Serving dinner to all family members and having dinner		
9:30-10:30 PM	Cleaning utensils		
10:30-11:30 PM	Going to bed		
<b>13.5</b>	<b>Working hours/Day</b>	<b>9.5</b>	<b>Working hours/Day</b>

Source: Focus Group Discussion, 2013

### 3.1.4 Intra-households Analysis

Father or father-in-law ranks first in intra household analysis and holds the greatest power and control over financial and materialistic resources. There is greatest influence of father/ father in law in decision making in family. Son in the family shares second rank in holding power and control over financial and materialistic resources. Female members of the family are ranked the least. The details intra-household analysis has been presented below (Table 4).

**Table 4: Intra household analysis**

Indicators	Son	Daughter	Daughter in Law	Mother/ mother in Law	Father/ Father in law	Grandson	Granddaughter
Ownership of land	3	1	2	4	5	-	-
Serve the food first	2	1	1	4	5	1	1
Breakfast	2	1	1	4	5	1	1
Having meat/ fish	2	1	1	4	5	1	1
Having milk/ ghee	2	1	1	4	5	1	1
Having amount of vegetables	2	1	1	4	5	1	1
Having amount of fruits	2	1	1	4	5	1	1
Wearing cloth	2	2	1	1	1	4	4
Contact with offices	7	-	-	1	7	-	-
Kitchen work	-	5	8	2	-	-	-
Guidance to laborer	2	-	-	5	8	-	-
Borrowing credit	5	-	-	5	5	-	-
Household head	3	-	1	5	6	-	-
Love and affection	3	2	-	-	-	-	-
Control over parental property	7	-	5	-	-	3	-
School enrollment	4	4	2	-	-	3	2
Health	2	2	2	2	3	2	2

facilities							
Care during delivery	-	6	9	-	-	-	-
Influencing in household decision	4	-	1	3	7	-	-
Amount of 'Dachinna in Dashin'	2	2	1	-	-	5	5
Use of soap during bathing	2	2	2	2	3	2	2
Rest hour	4	-	3	4	4	-	-
<b>Score</b>	<b>60</b>	<b>32</b>	<b>43</b>	<b>59</b>	<b>79</b>	<b>29</b>	<b>24</b>
<b>Ranking</b>	<b>II</b>	<b>V</b>	<b>IV</b>	<b>III</b>	<b>I</b>	<b>VI</b>	<b>VII</b>

Source: Focus Group Discussion, 2013

### 3.2. Summary of Socio-economic Status of the study areas

#### 3.2.1 Well-being Ranking

The economic status of people is classified into four groups: Well off, Medium, Poor and Ultra poor. The group is classified on the basis of house type, possession of materials and employment type. The wellbeing ranking conducted in a settlement in Lahan-1 has shown that only 2 out of 41 households in the community are well off whereas 18 households belong to ultra poor group. The wellbeing ranking of different social classes in the community has been presented below (Table 5).

**Comment [SS5]:** Same as section 3.1, it would be good to include a brief explanation of the items and their importance in this study.

**Table 5: Well-being ranking status**

Economic status	Number	Community indicators
Well off	2	Cemented house, possess two-wheelers, have private tap connection, have own land
Medium	9	House with aluminum sheet roof, possess cows and buffaloes, Foreign employment, possess own rickshaw
Poor	12	House with thatched roof, possess some goats and chicken, daily wages
Ultra poor	18	House with hay roof, possess no cattle, no assets, no land, no skill

Source: Focus Group Discussion, 2013

#### 3.2.2 Prosperity Mapping

The poor are defined by the Nepal Living Standards Survey (NLSS) 2011 as households or persons who consume an average of less than 2,220 Kcal of food per person per day and spend less than NPR. 11,929 per capita per year on food and less than NPR 7,332 per person on non-food items. The society can be viewed as prosperity level as well in order to mapping.

*Prosperous* often describes a person or a person's future, but it can apply to anything that's experiencing growth and success. *Prosperous* derives from the Latin word *prosperous*, meaning "doing well." The community can be classified based on the prosperity level as defined by the community people themselves using their best judgment. It could be context specific from one community to another.

Household prosperity mapping is conducted on the basis of house, land holding and other different indicators. Those holding more land and access to resources and services fall under high class while those who hold less land and have limited access over resources and services fall under low class. Around 65 percent people here in Lahan-6 fall under low class. The prosperity mapping of the community has been presented below (Table 6).

**Table 6: Household Prosperity Mapping**

Indicators/Classes	High	Medium	Low
1. House	3-4 storey cemented house with cemented roof	Cemented house with aluminum sheet roof	Small hut made of mud with thatched roof
2.Land holding	Owned more than 1-2 Bigha of irrigated land. Possess land near the market and main road	Owned more than 10 Kattha of land.	Owned 2 Dhur of land
3.Drinking water	Private tap connection, within 5 minute distance	Private tube well, within 5 minute distance	Public tap, public tube well, within 10-20 minute distance, queue up for 30 minutes during dry season
4.Sanitation	Access to private toilet and no open defecation	Few have access to toilet and open defecation is practiced	None of the households have toilet and open defecation is practiced
5.Education	Attending private and boarding schools	Attending public and government schools	Access to primary education in government schools
6.Health Facilities	Access to well-equipped hospitals and private clinics in Lahan, Dharan, Sitamadi, Dharbhanga, India, etc	Access to private clinics and government hospitals in Lahan	Access to government hospitals. Mostly depend on faith healers
7.Main Occupation	Business, government service holder	Agricultural farming	Daily wages, labour
8.Marriage	Marriage with high class	Marriage with medium class	Marriage with poor class
9.Power relation	Access to government services, central level leaders and ministers. Hold key position in the society	Access to district level leaders and less access to government services	Access to local level leaders and hold no any key position in the society
10. Food Self-Sufficiency	10-12 months food self sufficiency	3-9 months food self sufficiency	Food insecurity. Earn daily and eat daily. Need to sleep without food when there is no earning at all.
11.Cash holding	Bank account operation, huge banking transactions	Little savings in the bank	Daily saving of Rs. 10-20 in saving and credit group
12.Owned ornaments	50-60 gm gold	10-20 gm gold	Have gold plated ornaments only.
13.Owned Radio/T.V.	Expensive radio and 21" LCD TV	Have Chinese radio and 14" color TV	Some households have 14" color TV
14.Owned Mobile	All the family members have	Have 1-2 mobile phones	Some households have

**Comment [SS6]:** It is better to add another column to the left for the numbers

**Comment [SS7]:** It would be good to explain the exact amount of saving and transactions to prevent qualitative comparison.

Phone	latest smart phones		Chinese mobile sets
15.Electricity	Access to electricity. Use of Inverter during load shedding	Access to electricity. Use of chargeable lights during load shedding	Access to electricity. Use of candles during load shedding
16.Computer/Laptop	LCD computer/laptop	Desktop computer	No
17.Expenses in festivals	Spend Rs. 20,000 – 40,000 during Dashain and Tihar	Spend Rs. 10,000 – 15,000 during Dashain and Tihar	Spend Rs. 1000 – 5000 during Dashain and Tihar
18.Employment Opportunities	Access to USA and Europe	Access to Dubai and Qatar	Access to Delhi, Punjab and Baharain
19.Food grains production	Produce food grains, vegetables, fruits or purchase from market	Produce vegetables, grains, fruits	No production
20.Livestock	4-6 buffaloes, 10-15 goats	2-4 buffaloes, 4-6 goats and 6-8 chickens	2-5 chickens
21.Clothing	Expensive/fancy clothes, change clothes in every two months	Use clothes ranging from Rs. 500 – 1000	Cheap/low quality clothes
22.Food consumption	Eat balanced diet (Basmati rice, vegetables, milk, curd, ghee, fish, meat, etc)	Rice, pulse, vegetables, yogurt and consume fish and meat twice a week	Rice, dal and vegetables. Consume meat twice a month
23.Politeness	Good hospitality, use sophisticated language	Use natural language	Use common language and express anger and frustrations with outsiders
24.Vulnerability	Less vulnerable from natural disaster due to good economic condition	Vulnerable from natural disaster	Highly vulnerable from natural disaster due to poor economic condition
25.Population	5 %	30%	65%

Source: Focus Group Discussion/Direct Observation, 2013

### 3.3 Power Centre and their Relationship

Power relations are the interactions between different groups in a society. Power relations are the ability of one group or a person to control others, and they exist at all levels of society. Power relations exist in societies around the world.

Leader of Nepal Congress seem more powerful in the community as he has relationship with the community people as well as the minister, government agencies and influential people in the district. Similarly, the community people hold no power as they do not have direct relationship with the influential and government agencies.

### 3.4 Mobility of the Community

Mobility mapping shows the people's movements within and outside their community for services, entertainment, education, marriage, treatment, marketing etc. People in *Biharpur* of Lahan municipality-3 visit Lahan General Hospital and Kathmandu for treatment while they visit *Babadham*, *Sakhara* and *Pashupatinath* for pilgrims.

### 3.5 Inflow and Outflow of food and Non-food items in Lahan

**Comment [SS8]:** Qatar is correct name of the country.

**Comment [SS9]:** Bahrain is the correct name of the country.

**Comment [SS10]:** Same as the raw (11), it is better to prevent qualitative comparison.

**Comment [SS11]:** Please explain how this paragraph is decided. What data or resources is used to conduct this outcome?

Goods and services flow through the economy in one direction while money flows in the opposite direction. Households also sell their labor, land, and capital in exchange for income that they use to buy goods and services that firms produce.

The major food and non-food items imported in Lahan municipality are rice, medicines, clothes, machinery parts and hardware materials while the major items exported from the municipality are fruits, vegetables and meat items. Inflow and outflow of food and non-food items in the Lahan Municipality is tabulated below (Table 7).

**Table 7: Inflow and Outflow of food and non-food items in Lahan Municipality**

Inflow of Commodities	S.N	Outflow of Commodities	Remarks
Rice	1	Fruits(Litchi, Mango, Guava)	
Medicines	2	Vegetables (potato, Cauliflower, Brinjal, Onion, Chilly)	
Clothes	3	Meat item (Fish, Goat, chicken, pork.)	
Machinery parts	4	Animals (Cow, Buffalo, Goat)	
Hardware materials (cement, rod, tiles, etc)	5	Small Dhiki pump	
IT equipments (computer, Laptop, camera, etc)	6	Polythene bags	
	7	Plywood	
	8	Milk	

Source: Focus Group Discussion, 2013

**Comment [SS12]:** What does this abbreviation stand for?

**Comment [SS13]:** This column is not necessary.

### 3.6 Seasonality

A seasonal calendar is a visual method of showing the distribution of seasonally varying phenomena (such as economic activities, resources, production activities, problems, illness/disease, migration, and natural events/ phenomena) over time.

The leisure season for the people in Lahan municipality is Bhadra, Ashwin and Kartik while the busy season is Ashadh, Shrawan, Mangsir and Poush. This seasonal analysis is particularly useful for understanding constraints and major problems that might emerge only at certain times of the year. Programs and activities related to water, sanitation and hygiene can be designed based on the seasonal calendar. The seasonal calendar has been presented below (list 1).

**List 1 : Seasonal Calendar of Lahan Municipality**

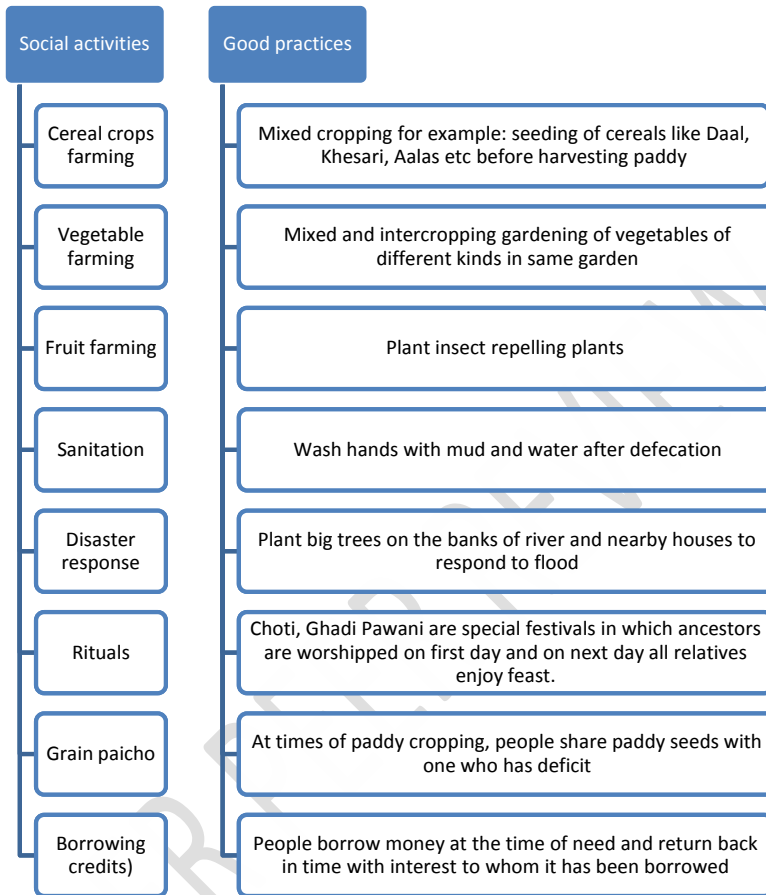
Details	Months												
	Baishakh	Jestha	Ashadh	Shrawan	Bhadra	Ashwin	Kartik	Mangsir	Poush	Magh	Falgun	Chaitra	
High Interest rate													
Leisure													
Busy season (paddy)													
Drinking water scarcity													
Fire wood scarcity													
Food deficit month													

**Comment [SS14]:** it would be good to explain the Gregorian equivalent of the months.

**Comment [SS15]:** It would be good to change this table to a Gant chart.







(Source : Focus Group Discussion, 2013)

### 3.8 Ward wise

#### Ranking of Lahan Municipality

Out of 10 wards in Lahan municipality, ward no. 4 is lagging far behind in terms of water, sanitation, hygiene, social and economic status. Ward. No. 4 is at ninth place for poor water, sanitation, hygiene, social and economic status while ward number 7 is at the first place in terms of improved water, sanitation, hygiene and economic status. Ward wise ranking of Lahan municipality have shown below (Table 8).

**Table 8: Ward wise ranking of Lahan Municipality**

Ward	Water status	Sanitation status	Hygiene status	Prosperity status	Gender equality	Caste/ ethnicity	score	Rank
1	10	11	8	8	11	12	60	V
2	9	9	9	7	7	10	51	VIII
3	8	8	12	7	6	10	51	VIII
4	9	9	8	7	7	10	50	IX
5	14	7	10	8	7	7	53	VII
6	15	13	13	9	12	8	70	II
7	19	15	13	11	12	9	79	I
8	16	10	10	12	10	8	66	III
9	10	11	9	7	12	8	57	VI
10	10	10	13	10	11	9	63	IV

Source: Focus Group Discussion, 2013

### 3.9 Risk Assessment

Thapa (2018) has defined that the disaster is the serious disruption of the functioning of a community due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts (Thapa, 2018). The disaster risk is regarded as the potential loss of life, injury, destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability and capacity.

MOAC & FAO (2011) has stated that the floods, landslides, droughts, inundation and other weather and climate-induced hazards are almost regular phenomena in Nepal. High socio-economic vulnerability of local communities and sectors – remote, rural, rugged and fragile geophysical environment mixing with unplanned settlement, population pressure, low social capacity to mitigate risk and prepare for difficulty – create scenarios of high risk, inviting disaster. Those likely to suffer the most are the poor, marginalised and disadvantaged social groups, whose limited access to resources make them least able to adapt, prepare and cope to their precarious environment (MOAC & FAO, 2011).

Community Based disaster risk management promotes the involvement of affected communities in disaster risk management at the local level. This includes community assessments of hazards, vulnerabilities and capacities, and their involvement in planning, implementation, monitoring and evaluation of local action for disaster risk reduction.

Lahan is a flood prone area. Lahan has been affected mostly by flood in monsoon season. The flood in 'Khuttikhola' in the year 2057 B.S destroyed 50 household and killed 3 people. Similarly, fire in the year 2067 B.S caused great financial loss which turned three households into ashes. Time trend of Disaster in Lahan is shown in the table below (Table 9).

**Table 9: Time trend of disaster in Lahan municipality**

Time	Disaster	Social and economic impact
1990 B.S	Earthquake	Number of people died and majority became homeless
2045 B.S	Earthquake	Destruction and crack in house
2057 B.S	Flood in Khuttikhola	Destruction of 50 households and 3 people died
2067 B.S	Fire	3 household were burned leaving 3 families homeless
2069 B.S	Epidemic in animals	Animals of 20 household died causing great

**Comment [SS16]:** It is good to add a one line explanation about how the score is calculated. In addition, the scoring system for each parameter should be explained.

**Comment [SS17]:** References are needed.

		financial loss
--	--	----------------

Source: Focus Group Discussion, 2013

### 3.10 Sources of Social Conflict

Social conflict theory sees social life as a competition and focuses on the distribution of resources, power, and inequality. Conflict theorists view society as an arena of inequality that generates social conflict and social change website: [https:// study.com/...social-conflict-theory-in- sociology-definition-lesson-quiz.html](https://study.com/...social-conflict-theory-in-sociology-definition-lesson-quiz.html) accessed on 2/25/19.

**Comment [SS18]:** It is better to insert the link in the references.

Political/vote politics and religion are the major source of social conflict in Lahan municipality while untouchability and polygamy are the minor sources of social conflict. (Fig. 1). :The source of social conflict in Lahan municipality has been shown below



Source: Focus Group Discussion, 2013

### 3.11 Problem Analysis

Lack of safe toilet is the major problem in Lahan municipality. Lack of safe toilet ranked first among the list of major problems in Lahan municipality. Similarly, lack of awareness on water, sanitation and hygiene ranked second in list of major problems in Lahan Municipality. The following table (Table 10) depicts the problem analysis.

**Table 10: Problem Analysis**

Problems	Score	Rank
Lack of safe toilet	92	1
Lack of awareness on WASH	68	2
Lack of embankment in KhuttiKhola	55	3
Lack of safe drinking water	49	4
Lack of political will to address WASH issues	39	5
Lack of women employment opportunities	35	6
Solid waste and drainage problem	34	7
Poverty	31	8
Population explosion	24	9
Lack of health workers	23	10
<b>Total</b>	<b>450</b>	

Source: Focus Group Discussion, 2013

WAN (2018) has stated that 77 percent of faecal sludge is unsafely managed and 23 percent is safely managed. The 77 percent of faecal sludge not properly managed consists of 39 percent of faecal sludge emptied from onsite systems but not delivered to treatment; 30 percent of faecal sludge not contained and not emptied coming from pits and holding tanks constructed with impermeable walls and open bottoms in areas of high risk of groundwater pollution; three percent of sludge coming from toilets connected to open drains which is not treated and 7 percent from people practicing open defecation (WAN, 2018 p. 6).

### 3.12 Stakeholder Analysis

The key stakeholders working for water, sanitation and hygiene sector in Lahan municipality are Water Supply and Sanitation Division Office, Nepal Water Supply Corporation and Lahan municipality. Similarly, there are local non-government organizations working in water, sanitation and hygiene sector. List of major organizations and their key problems and strengths and area of improvement for NGOs and CBOs have been presented in (Table 11).

**Table 11: Stakeholder Analysis related to WASH Program in Lahan, Siraha**

S. N.	Main Organizations	Key Programs	Geographical coverage	+ve/-ve Impacts or Unknown
1	Water Supply and Sanitation Division Office	WASH	10 wards	+ve (water supply in the municipality)
2	Nepal Water Supply Corporation	Water	10 wards	+ve (water supply in the municipality)
3.	Lahan municipality	WASH	10 wards	+ve (tube well installation, drainage construction, dustbin distribution, etc)
4	CEAD Nepal	Social mobilization	Ward nos. 5, 6, 8, 9 and 10	+ve (awareness on municipality budget and programs, municipality budget increased, public participation increased )
5	PEACE Nepal	Social mobilization	Ward nos. 1, 2, 3, 4 and 7	+ve (awareness on municipality budget and programs, municipality budget increased, public participation increased )
6	Poverty Alleviation Fund (PAF)	Poverty alleviation	Ward nos. 5 and 10	+ve (Working to uplift financial status of people through different income generating activities like livestock and animal husbandry, etc)
7	Helping Hands	Women	10 wards	+ve (Active role in women empowerment and end violence against women, etc)

**Comment [SS19]:** What does this column represent?

8	SamagraJanauthan Kendra	Community development	Ward nos. 5, 6, 9 and 10	+ve (Mass sensitization on plans and programs and budget utilization by the municipality through mass media)
9	OREC Nepal	Women	All wards of Lahan Municipality	+ve (working to end violence against women and provide free legal consultations)
10	Dalit Janakalyan Yuva Club	Dalit upliftment	Ward nos. 9 and 10	+ve (Working for dalit upliftment, providing empowerment trainings to dalits, etc)
11	Chimeki Samaj Sewa	Cooperative and agri-business	All wards of Lahan Municipality	+ve (improve agriculture practices)
12	INSEC	Human rights	All wards of Lahan Municipality	+ve (Protection and promotion of human rights)
13.	Community Learning Centre	Agri-business	Ward nos. 2, 4	+ve (Training on new technologies in agriculture)
14	Saurya Urja Bikas Kendra	Solar panel promotion	Ward no. 10	+ve (Biogas, improved stoves promotion)
15	Blue Diamond Society	HIV Aids/Third Gender issues	Ward nos. 1, 6, 7 and 10	+ve (public awareness on HIV AIDS)

Source: Focus Group Discussion, 2013

### 3.13 Community Perception towards Water and Sanitation

“All the development projects and budget come in the name of Dalit and marginalized groups but the budget does not reach its targeted beneficiaries. The influential and political leaders misuse the funds meant for the poor and needy people like us,” says Devi Pasman (name changed), 45, Biharpur #3.

“We are more dependent on tube well water. We know that it is rich in iron but we do not have any alternative for water. Our children are suffered from kidney and skin disease problem due to consumption of such water,” says Dila Pasman (name changed), 52, Biharpur #3.

“Toilet does not fall under the priority of people. Food and shelter is their first priority. People here in poor settlement think that it is a waste of time and money to construct toilet. In addition, they are habitual to open defecation. Unless and until, their behavior and mindset is changed, toilet construction in poor settlements is not possible,” says Ram Kishore Shah (name changed), 46, Sahanichowk, Lahan-4.

“My husband is a rickshaw driver and his daily income is merely enough to manage two-time meal for the family of eight members. How can a poor family like us construct a toilet,” says Mrs. Guljari Mandal (name changed), 37, Sahanichowk, Lahan-4.

“I work in Khuttikhola as a daily wage laborer. During flood in Khuttikhola, I do not get work and I have to stay in the home. I hardly manage one time meal for the family. Toilet construction is a far cry for us,” says Kusum Lal Mandal (name changed), 40, Sahanichowk-4.

**Comment [SS20]:** I believe that it would be better to categorize all of the gathered data and present it with figures, charts and tables instead of listing them.

“We do not want development that bring contract and money making rich the richer and poor the poorer, instead we want development that secure our livelihood, which provide equal opportunities in education, health and employment” says Dev Ram (name changed), 54, Lahan-10, Gothtole.

“We are economically poor to contribute economically in development activities but we are rich enough to contribute our labour if development activities are implemented though we have to cut our daily wages for few days leaving us hungry,” says Phek Ram (name changed), 45, Lahan-10, Gothtole.

#### 4. CONCLUSIONS

Groundwater is abundant in lowland Terai region where it is an important resource for domestic consumption. However there has been the problem of arsenic concentrations in the ground water that cause negative effect in the public health. The large majority of the people in ward no. 4 of Lahan municipality do not have toilet and they still practice open defecation. Similarly, majority of the people belong to poor and marginalized group and they do not have access to safe drinking water as well. In the study areas particularly in ward no. 4 is lagging far behind in terms of water, sanitation and hygiene facilities. In addition, ward no. 2 and 3 of Lahan municipality are also far behind in terms of water and sanitation coverage. Therefore, some community people have desperate need of Water, sanitation and hygiene as well. There is the problem of social discrimination in terms of gender and social inclusion, untouchability, poverty and poor access to education and health facilities among Dalit communities as well in the area. (Mahat & Paudel, 2020).

#### REFERENCES

##### References

Chhetri, R., Nepal, B., Bhandari, R., Dhungel, L. R., Timalina, B., & Karki, B. B. (2012). *Children and war in Nepalese district and actors accomplishment*. Kathmandu and Pokhara: Walson and Company.

Mahat, H. B., & Paudel, D. M. (2020, January 12). Maoist and altimate war. (L. R. Sharma, Ed.) *Humanities and Socioal Science*, 1(2), 77.

MoAC, & FAO. (2011). *Disaster risk panagement plan in siraha district. kathmandu*. Kathmandu: Government of Nepal Ministry of agricultorea and ooperative.

Fast online. Gender-Access to and Control over resources. [www.fastonline.org/CD3WD](http://www.fastonline.org/CD3WD) accessed on February 27, 2019.

Lahan Municipality. (n.d). *Lahan Municipality Brief Descriptions*. Website: <http://lahanmun.gov.np/> accessed on February 25, 2022.

**Comment [SS21]:** The process with which the author(s) have reached this conclusion is unclear. It should be explained completely how each parameters is achieved and what's the impact of each of them in author(s) decision in addition to their relation to the topic of the paper "Study on an Analysis of Water, Sanitation and Hygiene Practice" It is better to prevent personal analysis or qualitative comparisons.

**Comment [SS22]:** One single reference (Focus Group Discussion, 2013) is used for most table data but it is not mentioned in the reference list. Therefore, I do not have any access to it and can not confirm the authenticity or correctness of it.

Lahan Municipality. (2017). *Lahan ODF monitoring report*. Siraha: Lahan Municipality.

MOAC & FAO. (2011). *Disaster Risk Management Plan in Siraha District*. Kathmandu: Government of Nepal, Ministry of Agriculture and Cooperative.

MOPH. (2013). *Operational Guidelines for Gender Equality and Social Inclusion Mainstreaming in the Health Sector*. Kathmandu: Ministry of Health and Population, Government of Nepal.

Pathak, L. R. (2006). *A Report on Evaluation Study of Health Impacts Due to Arsenic Contamination in the Selected Communities of Terai Regions in Nepal*. Kathmandu: Nepal Health Research Council.

Shrestha, R. R., M. P. Shrestha, N. P. Upadhyay, R. Pradhan, R. Khadka, A. Maskey, S. Tuladhar, B. M. Dahal, S. Shrestha, and K. B. Shrestha. (2004). *Groundwater Arsenic Contamination in Nepal: A New Challenge for Water Supply Sector*. Kathmandu: Environment and Public Health Organization.

Social Conflict theory in sociology definition. Website: [https:// study.com/...social-conflict-theory- in- sociology- definition-lesson-quiz.html](https://study.com/...social-conflict-theory-in-sociology-definition-lesson-quiz.html) accessed on 2/25/19.

Thapa, N.B. (2005). *Participatory Monitoring, Reporting and Evaluation System: Measuring the Qualitative Social Change*. Kathmandu: Sudeepa Publications.

Thapa, N.B. (2018). *Research Methodology and Dissertation Writing*. Kathmandu: Jana Bikash Pvt. Ltd.

Thapa, N.B. (2018). *Manual in Community Based Disaster Risk Management (Unpublished)*. Lalitpur, Nepal: Lumbini International Academy of Science & Technology.

Tuinhof, A. and M. Nanni. (2003). *Arsenic Testing and Finalization of Groundwater Legislation, Nepal*. Washington DC: World Bank Group.

GESI Working Group (2017). *Gender Equality and Social Inclusion Working Group*. Kathmandu: International Development Partners Group, Nepal.

WAN. (2018). *SFD Lite Report of Lahan Municipality*. Kathmandu: WaterAid Nepal.

World Bank. (2005). *World Bank Regional Operational Responses to Arsenic Workshop, Nepal, 26–27 April 2004*.